The vibration and stability problems of functionally graded material (FGM) cylindrical shells subjected to external pressures with mixed boundary conditions (MBCs) using first order shear deformation theory (FOSDT) is studied. The governing equations of FGM cylindrical shells (FGMCSs) are displayed according to the Donnell type shell theory and solved using the Galerkin’s method. The novelty in this study is to obtain closed-form solutions of the eigen-value problem in mixed boundary conditions within the framework of the FOSDT. Finally, the effects of different volume fractions, FG profiles and shell characteristics on the critical parameters of FGMCSs with MBCs are studied in detail.